radiation oncology centers worldwide. We now know that these side effects can most often be attributed to the use of outdated RT techniques. As treatment techniques started to improve, enabling to limit the dose to the organs at risk, prospective trials were initiated to evaluate the contribution of lymph node treatment to overall outcome for early stage breast cancer patients. The results of several studies were presented over the last couple of years. They demonstrate that an increased disease-free survival rate following a decrease of the risk of distant metastases can be obtained in patients with risk factors, including those with involvement of the axillary lymph nodes and those with a centrally or medially located primary tumour. Moreover, a trend towards an improved overall and (statistically significant for some of the studies) breast cancer specific survival was demonstrated. No increase was seen in the other causes of death and, at a median follow-up of around 10 years, no significant or clinical relevant increased toxicity was found, apart from a slight increase in the risk for pulmonary toxicity. The concept of "any recurrences", introduced by the EBCTCG in 2011, as important endpoint of the evaluation of the effect of all types of treatments (including locoregional ones such as surgery and RT) fits much better to the interpretation of the recently presented results. In this era of earlier diagnosis and more widespread use of adjuvant systemic treatments leading to a 10-year overall survival exceeding 80%, clinically detectable locoregional recurrences as a separate endpoint might indeed be considered as less relevant. Firstly, the patient will be affected heavily by any type of recurrence and secondly because of the complex interaction between the efficacy of systemic treatments with the influence of loco-regional treatments on overall survival. By merely focusing on locoregional control, we risk to neglect that once distant metastases are found no further efforts are undertaken to detect locoregional recurrences. By eliminating microscopically non-detectable cancer cells in the lymph nodes with RT, the risk of secondary metastasizing of those cells and thereby ultimately the overall risk of recurrence of the breast cancer will be reduced. This is in line with the findings of the EORTC trial in which a trend was seen towards more benefit for patients who where treated with both hormonal treatment and chemotherapy and less benefit for the small group of patients with 10 or more involved axillary lymph nodes: patients with a better prognosis (lower risk factors and/or better systemic therapy) experience more benefit from locoregional treatments. With modern RT techniques, the benefits of optimizing locoregional control will likely not be counterbalanced by side effects including late cardiovascular mortality. Moreover, the new ESTRO guidelines for target volume delineation clearly reduce the size of the target volumes while simultaneously considering the regional lymph nodes even more than before as a whole. We also expect that the real benefit of loco-regional RT used to be diluted in the past (including the recently presented trials) by suboptimal dose coverage of the target volumes. Therefore, we expect that with contemporary RT techniques and appropriate target volume delineation, not only a significant reduction of the dose to the organs at risk but also a much better coverage of especially the internal mammary lymph nodes is achievable, which is likely to result in a further improvement of the benefit of locoregional RT for patients with early stage breast cancer that have a risk for bearing microscopical tumor deposits in the regional lymph nodes.

SP-0017
Technical approaches to regional lymph node irradiation for breast cancer
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The quality of radiotherapeutic approaches to treating locoregional lymph nodes in breast cancer is improving. This talk will review the latest evidence pertaining to each aspect of the planning and treatment pathway in order to inform best practice. Recently published atlases capable of improving consistency in outlining target and non-target volumes will be reviewed. Using data relating outcomes to dosimetry, we will then review the evidence base for target and non-target tissue dose constraints and objectives. Different radiotherapeutic approaches including breath-hold, volumetric-modulated arc therapy, and proton beam therapy will be compared in terms of dosimetry and resource implications. Potential efficiency savings in the treatment pathway will also be discussed together with a review of the possible impact of bluer-sky technologies.

Symposium: Assessment and management of rectal morbidity

SP-0018
Towards a scoring system built on six distinct radiation-induced illnesses producing late gastrointestinal effects
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As shown in randomized studies, radiotherapy has a critical role when we cure prostate cancer by using multimodal treatment strategies. We frequently use radiotherapy to cure gynecological cancer. Both Intensity-Modulated Radiation Therapy and Volumetric Modulated Arc Therapy have the potential to drastically increase the ratio between possibilities for cure and risk of late effects. Still, crude measurements of patient-reported outcomes, as well as factors that may modify the how radiation cause late effects, compromise these possibilities. We lack details to provide parameters from dose-volume modelling to utilize the full potential of these new technologies. Concerning bowel health, current scoring systems of radiation-induced late gastrointestinal must be refined. Important socially invalidating symptoms are not scored. An example is unexpected defecation into clothing – not sensing the need to go to the toilet and a sudden defecation into clothing as if one were already on the toilet. We documented this symptom among 11 percent of gynecological-cancer survivors. Another example is frequent and uncontrolled noisy flatulence. Traditional scoring systems have scales that do not distinguish or clearly depict person-incidence (events per individual per time unit), intensity and duration. But, probably most important, as we learn that decreased bowel health depends on several different types of radiation-induced illness, we understand that grouping symptoms from different illnesses together in a score compromises our ability to acquire knowledge for prevention or relief. We cannot disentangle these different radiation-induced illnesses when symptoms from several illnesses are grouped together in the data sets we retrieve. Clearly, new strategies are needed. In my talk, I will propose a scoring system based on the data indicating that the at least 28 radiotherapy-induced atomized late gastrointestinal symptoms derive from six distinct illnesses, that is, six sets of risk organs or mechanisms. We have data from around 1500 survivors supporting this position. As we accumulate data for each of these six illnesses, we can define parameters in dose-volume models built on patient-reported outcomes much better than we previously could. Possibly we can also learn how, by employing probiotics or dietary changes, we can influence the interplay between the gut flora and stem-cell renewal to counteract inflammatory processes that probably are important for several of the six illnesses. Moreover, the knowledge may stimulate development of mouse models in which we can test, for example, how different bacterial species influence radiation-induced inflammation in the rectal wall. In the talk, I will give preliminary results from the establishment of such a model. A simplified nomenclature could label the six illnesses as involving processes resulting in leakage-related symptoms, urgency-related symptoms, constipation-related symptoms, symptoms

related to excessive mucus production, symptoms related excessive gas production gas and symptoms related excessive blood production. A modern scoring system should have two or more atomized symptoms related to each of the six illnesses and appropriate response scales for frequency, intensity and duration.

SP-0019
Measuring anorectal toxicity and function
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Anorectal toxicity is a relevant side effect of pelvic radiotherapy for rectal, anal, gynaecologic and prostate cancer. Toxicity can be scored objectively by the physician according to established systems such as the CTCAE classification. In recent years, patient-reported outcomes (PROs) have received increasing attention when evaluating acute toxicity as well as late effects of cancer treatment. These include information directly obtained from the patient on symptoms and impairment as well as on quality of life. This presentation will focus on validated instruments to measure PROs related to anorectal function, including quality-of-life questionnaires and organ modules, e. g. those developed by the EORTC Quality of Life Group, and symptom questionnaires e. g. to measure continence. Objective measurements to quantify anorectal function such as sphincter manometry and endoscopic scores will be reviewed. The relationship between PROs and objective function assessment with physician-rated toxicity will be addressed. The outcomes for the above endpoints in major trials of pelvic radiotherapy will be presented, with a focus on rectal cancer and the effects of treatment concepts including short-course radiotherapy and long-course chemoradiation. Finally, dose-volume constraints in pelvic radiotherapy treatment planning and potential effects of highly conformal techniques such as IMRT or VMAT on anorectal symptoms, function and quality of life will be examined.

SP-0020
Rectal spacers to minimise morbidity in radiotherapy for prostate cancer
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Radiotherapy is a well recognozed curative treatment option for localized prostate cancer. Optimal tumor control rates can only be achieved with high local doses, associated with a considerable risk of rectal toxicity - regarded as dose-limiting toxicity. Apart from already widely adapted technical advances, as intensity-modulated radiation therapy and image-guided radiotherapy techniques, the application of spacers placed between the prostate and anterior rectal wall has been increasingly used in the last years.
Biodegradable spacers, including hydrogel, hyaluronic acid, collagen or an implantable balloon can create the desired effect. They can be injected or inserted in a short procedure under transrectal ultrasound guidance via a transperineal approach. A distance of about 1.0-1.5cm is usually achieved between the prostate and rectum, excluding the rectal wall from the high isodoses. Several studies have shown well tolerated injection procedures and treatments. Apart from considerable reduction of rectal dose compared to radiotherapy without a spacer, clinical toxiciyt results are favourable. A prospective randomized trial demonstrated a reduction of rectal toxicity after hydrogel injection in men undergoing prostate image-guided intensity-modulated radiation therapy. The results are encouraging for continuing evaluation in dose escalation, hypofractionation, stereotactic radiotherapy or re-irradiation trials in the future.

Symposium: Towards user oriented QA procedures for treatment verification

SP-0021
How to ensure the quality in brachytherapy treatment planning systems?
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Treatment planning systems (TPSs) are of high importance in modern brachytherapy. The users rely on the output of these special software; wrong calculations may result in severe patient harm. Thus it is necessary to systematically check these software programs.
Many checks in TPSs are identical for high-dose-rate brachytherapy with afterloaders and low-dose-rate brachytherapy with seeds. But some differences exist, e.g. as checking of afterloader parameters.
After the installation of the software the acceptance test is to be carried out. This test protocol is typically provided by the vendor and should be passed before further checking. In a second step the commissioning is carried out. In this procedure all clinical relevant data and properties of the TPS must be tested and reported. Examples for items to check are:
- Afterloader characteristics (number of channels, min./max. channel lengths, max. allowed dwell time, …)
- Source characteristics (nuclide, decay, …)
- TG-43 consensus dataFor Model-based dose calculation algorithms, commissioning following TG-186 report
- Applicator checks

To ensure the consistency and data integrity of the TPS periodical tests should be performed after the commissioning. Important points are to validate the integrity of base parameters of the TG-43 data and the recalculation of patient treatment plans.
Most TPSs offer inverse planning algorithms. The algorithm itself is often not fully transparent by the user, thus comparison with manual calculations is not practical. Nevertheless, the consistency of such planning technique can be checked by recalculation of a test plan using a constant parameter set. In addition to the tests above end-to-end tests can be performed to check the whole treatment chain, including imaging, TPS, afterloader, and data transfer.

SP-0022
Imaging
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In the past decade 3D image guided brachytherapy has been introduced into clinical practice worldwide. This enables conformation of the dose distribution to the target volume and avoidance of high dose to organs at risk (OAR) using CT, MR, and/or ultrasound (US) imaging. In such modern techniques sectional images give the relationship of the shape and the position of the applicator(s)/sources in relation to the anatomy of the patients. This means that the quality assurance (QA) programs also should include specific topics related to image quality additional to traditional procedures checking the source strengths and dose calculation issues. QA for image quality is well established in the area diagnostic and many of these procedures can be used also for brachytherapy. However, the procedures should be modified in order to reflect the conditions of use in brachytherapy compared to a diagnostic session.
To optimise the image quality in diagnostic procedures dedicated phantom is often used. Various image quality parameters are tested by evaluation for example slice thickness, spatial resolution, uniformity and noise. In contrast to diagnostic imaging, the ability to reconstruct several points or a geometric structure with high accuracy is crucial in brachytherapy. Therefore, a procedure to check the geometric accuracy have to be included in a QA program.